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| APPLICATION NO. | FILING DATE | FIRST NAMED INVENTOR | ATTORNEY DOCKET NO. | CONFIRMATION NO. |
|---|---|---|---|---|
| 10/820,440 | 04/05/2004 | James Gardner | 070917 | 7165 |

23696 7590 11/28/2008
QUALCOMM INCORPORATED
5775 MOREHOUSE DR.
SAN DIEGO, CA 92121

| EXAMINER | |
|---|---|
| TIMORY, KABIR A | |
| **ART UNIT** | **PAPER NUMBER** |
| 2611 | |
| **NOTIFICATION DATE** | **DELIVERY MODE** |
| 11/28/2008 | ELECTRONIC |

**Please find below and/or attached an Office communication concerning this application or proceeding.**

The time period for reply, if any, is set in the attached communication.

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us-docketing@qualcomm.com
kascanla@qualcomm.com
nanm@qualcomm.com

| Office Action Summary | Application No. | Applicant(s) | |
|---|---|---|---|
| | 10/820,440 | GARDNER ET AL. | |
| | Examiner | Art Unit | |
| | KABIR A. TIMORY | 2611 | |

*-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --*

**Period for Reply**

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE _3_ MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

**Status**

1)☒ Responsive to communication(s) filed on _07 August 2008_.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

**Disposition of Claims**

4)☒ Claim(s) _1-20,22-29 and 31-62_ is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) _1-20, 22-29, and 31-62_ is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

**Application Papers**

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

**Priority under 35 U.S.C. § 119**

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

**Attachment(s)**

1) ☒ Notice of References Cited (PTO-892)

2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)

3) ☐ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date _____.

4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .

5) ☐ Notice of Informal Patent Application

6) ☐ Other: _____.

# DETAILED ACTION

## Response to Arguments

1. This office action is in response to the amendment filed on 08/07/2008.

2. Applicant's arguments with respect to claims 1-3, 6-8, 10-20, 22- 28, 31-34, have been considered but are moot in view of new ground(s) of rejection.

## *Specification*

3. The specification is objected to as failing to provide proper antecedent basis for the claimed subject matter. See 37 CFR 1.75(d)(1) and MPEP § 608.01(o). Correction of the following is required:

Claim 6 recite a limitation "multiplying the long training subcarrier with a conventional 802.11 a long training pattern to form a first product; multiplying the long training subcarrier with an extended 802.11 long training pattern to form a second product" in lines 5-8. The examiner is unable to find any definition for this limitation in the specification. The examiner is respectfully requesting showing clear support and definition for this limitation in the specification.

## *Claim Rejections - 35 USC § 112*

4. The following is a quotation of the first paragraph of 35 U.S.C. 112:

> The specification shall contain a written description of the invention, and of the manner and process of making and using it, in such full, clear, concise, and exact terms as to enable any person skilled in the art to which it pertains, or with which it is most nearly connected, to make and use the same and shall set forth the best mode contemplated by the inventor of carrying out his invention.

5. Claim 61 is rejected under 35 U.S.C. 112, first paragraph, as failing to comply with the written description requirement. The claim(s) contains subject matter which was not described in the specification in such a way as to reasonably convey to one skilled in the relevant art that the inventor(s), at the time the application was filed, had possession of the claimed invention.

Claim 61 recite a limitation **"a machine-readable medium"** in line 1. There is no support for this limitation in the specification. Since this limitation was never introduced before, this limitation is new matter.

6. The following is a quotation of the second paragraph of 35 U.S.C. 112:

> The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

7. Claims 6-7 and 11-12 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

(1) Claim 6 recite a limitation **"extended 802.11"** in line 7. It is unclear which of the **<u>IEEE 802.11</u>** standard the claim is referring to. The examiner is respectfully requesting clarifying the limitation in the claim clearly.

***Claim Rejections - 35 USC § 102***

8. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

> A person shall be entitled to a patent unless –
>
> (e) the invention was described in (1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent or (2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effects for purposes of this subsection of an application filed in the United States only if the international application designated the United States and was published under Article 21(2) of such treaty in the English language.

**9. Claims 1-3, 20, 22-27, 38-45, 47-50, and 59-61 are rejected under 35 U.S.C. 102(e) as being anticipated by Perahia et al. (US 7352688).**

**Regarding claims 1, 20, 38, 47, 59, 60, and 61:**

As shown in figures 1-6, Perahia et al. discloses a method of transmitting signals using a plurality of transmit antennas, the method comprising:

- allocating the data to be transmitted among the plurality of transmit antennas (figure 1 shows plurality of transmit antennas. See col 4, lines 11-34), wherein at least one of the plurality of transmit antennas transmits some data that is not transmitted by all of the other of the plurality of transmit antennas (col 6, lines 26-29);
- transmitting a modified preamble (see figures 5 and 6) from each of the plurality of transmit antennas (106H and 106V in figure 1), wherein the modified preamble comprises a conventional 802.11a preamble structure and is distinguishable at a receiver (104 in figure 1) from a conventional 802.11a preamble (col 4, lines 22-34, col 6, lines 22-57).

**Regarding claim 2:**

Perahia et al. further discloses wherein the plurality of transmitters (figure 1 shows plurality of transmit antennas. See col 4, lines 11-34) transmit data in total at an extended rate above a corresponding 802.11 a data rate (col 1, lines 34-41, col 4, lines 30-34).

**Regarding claims 3 and 22:**

Perahia et al. further discloses wherein the modified preamble comprises a modified long training pattern distinct from a conventional 802.11 a long training pattern (see figures 5 and 6, col 6, lines 22-57).

**Regarding claim 23:**

Perahia et al. further discloses wherein the fields of the extended mode preamble include a modified signal field (col 6, lines 22-57).

**Regarding claim 24:**

As shown in figures 1-6, Perahia et al. discloses a method of communicating a packet, using a MIMO transmitter having a plurality of antennas (figure 1), over a wireless medium to a MIMO receiver (figure 2), the method comprising:

- obtaining data fields of a packet to be transmitted (figures 5 and 6);
- generating preamble fields of the packet to be transmitted, including an extended mode preamble (figures 5 and 6);
- transmitting the packet, including the extended mode preamble, as a signal into the wireless medium (figure 1, col 6, lines 22-57);
- receiving a representation of the signal from a wireless medium (see figure 1);

- at the receiver (figure 2), demodulating the signal to obtain a demodulated signal (col 4, lines 35-54);
- at the receiver, decoding, from the demodulated signal (col 4, lines 35-54), a packet data sequence including data representing at least a portion of a preamble (figure 5 and 6);
- where the receiver is a MIMO receiver (figure 2, abstract), processing the packet data sequence according to an extended mode operation (col 6, lines 22-57); and
- where the receiver is a conventional 802.11 a receiver (figure 2), processing the packet data sequence to determine at least one valid conventional 802.11 a preamble field and deferring further data reception related to that packet data sequence after determining, from the preamble, that the packet data sequence represents a packet not in conformance with a conventional 802.1 la packet (col 6, lines 22-57).

**Regarding claim 25:**

Perahia et al. further discloses wherein the fields of the extended mode preamble include a modified short training sequence (figure 5 and 6).

**Regarding claim 26:**

Perahia et al. further discloses wherein the fields of the extended mode preamble include a modified long training sequence (long symbols in figures 5 and 6) pattern distinct from a conventional 802.11 a long training pattern (col 6, lines 22-57).

**Regarding claim 27:**

Perahia et al. further discloses wherein the fields of the extended mode preamble include a modified signal field (512 in figures 5 and 6).

**Regarding claims 39 and 41:**

Perahia et al. further discloses wherein the plurality of fields decodable (210 in figure 2) by the conventional 802.11 a receiver (figure 2) comprises a plurality of fields having a conventional 802.11 a preamble timing structure (see figures 5 and 6).

**Regarding claims 40 and 48:**

Perahia et al. further discloses wherein the plurality of fields decodable by the conventional 802.1 la receiver comprises an 8 us short training field followed by an 8 us long training field followed by a 4us signal field (col 6, lines 33-45).

**Regarding claim 42:**

Perahia et al. further discloses wherein said signal field includes information identifying the length of the packet (see figures 5 and 6).

**Regarding claims 43 and 49:**

Perahia et al. further discloses wherein the modified preamble further comprises an additional signal field including said data corresponding to extensions to IEEE 802.11 a (see figures 5 and 6).

**Regarding claims 44 and 50:**

Perahia et al. further discloses wherein the data corresponding to extensions to IEEE 802.11 a comprises data corresponding to MIMO (see figures 5 and 6, abstract).

**Regarding claim 45:**

Perahia et al. further discloses wherein the data corresponding to extensions to IEEE 802.11 a comprise data corresponding to simultaneous transmission over multiple channels (MIMO is interpreted to be simultaneous transmission over multiple channels) (see figure 1, abstract).

**10. Claims 11 and 12 are rejected under 35 U.S.C. 102(e) as being anticipated by Thomson et al. (US 20030058951).**

**Regarding claim 11:**

As shown in figures 1-7, Thomson et al. discloses in a communications system having a channel divided into a plurality of adjacent frequency bands separated by out-of-band frequency ranges, wherein data is transmitted within the bands of the plurality of frequency bands, a method of increasing data capacity of the channel comprising:

- for data to be transmitted from a transmitter (par 0002), allocating a first portion of the data among the plurality of transmit frequency bands (pilots in figure 4a) and allocating a second portion of the data to at least one out-of-band frequency range (the pilots outside 16.5 MHz bands in figure 4a) when the first portion is allocated to adjacent bands (see figure 4a), wherein the at least one out-of band frequency range includes an out-of-band frequency range between the adjacent bands (3.5 MHz band in figure 4a) (par 0006, lines 14-17);

- transmitting the first portion within the plurality of transmit frequency bands (pilots in figure 4a); and
- transmitting the second portion within the at least one out-of-band frequency range (3.5 MHz in figure 4a) (figures 1b and 4, par 0006, lines 14-17).

**Regarding claim 12:**

The method of claim 11, further comprising:

- prior to transmitting at least the second portion of the data (figure 4a), transmitting one or more training symbols (figure 3) usable for a receiver to estimate transmission characteristics of the out-of-band frequency ranges (par 0002, par 0006, lines 14-17); and
- using received signal of the one or more training symbols (figure 3) to modify processing of a received signal corresponding to the second portion (figure 4a) of the data to account for the transmission characteristics of the out-of-band frequency ranges (3.5 MHz in figure 4a, par 0002, par 0006, lines 14-17).

### *Claim Rejections - 35 USC § 103*

11. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

**12. Claims 4, 5, and 29 are rejected under 35 U.S.C. 103(a) as being unpatentable over Perahia et al. in view of Crilly et al. (US 20020159537).**

**Regarding claim 4:**

As shown in figures 1-6, Perahia et al. discloses a method of transmitting signals using a plurality of transmit antennas, the method comprising:

- allocating the data to be transmitted among the plurality of transmit antennas (figure 1 shows plurality of transmit antennas. See col 4, lines 11-34), wherein at least one of the plurality of transmit antennas transmits some data that is not transmitted by all of the other of the plurality of transmit antennas (col 6, lines 26-29);
- transmitting a modified preamble (see figures 5 and 6) from each of the plurality of transmit antennas (106H and 106V in figure 1), wherein the modified preamble comprises a conventional 802.11 a preamble structure and is distinguishable at a receiver (104 in figure 1) from a conventional 802.11 a preamble (col 4, lines 22-34, col 6, lines 22-57),
- wherein the modified preamble comprises a modified long training pattern distinct from a conventional 802.11 a long training pattern (col 4, lines 22-34, and col 6, lines 22-57).

Perahia et al. disclose all of the subject matter as described above except for specifically teaching wherein at least a part of the modified long training pattern has a low cross correlation with a corresponding part of the conventional 802.11 a pattern, thereby facilitating discrimination based on cross correlation.

However, Crilly et al. in the same field of endeavor teach wherein at least a part of the modified long training pattern has a low cross correlation with a corresponding part of the conventional 802.11 a pattern, thereby facilitating discrimination based on cross correlation (figure 4, par 0084, lines 3-12). Therefore, it would have been obvious to one ordinary skill in the art at the time the invention was made to use the method of low cross correlation as taught by Crilly et al. to modify the system and method of Perahia et al. in order to improve detection sensitivity.

**Regarding claim 5:**

Perahia et al. further discloses wherein the at least a part of the modified long training pattern is transmitted using more than one of the plurality of transmit antennas (see figure 1) such that it is receivable and processable by one or more receivers (col 4, lines 22-34, col 6, lines 22-57).

**Regarding claim 29:**

As shown in figures 1-6, Perahia et al. discloses a method of transmitting signals using a plurality of transmit channels, the method comprising:

- allocating the data to be transmitted among the plurality of transmit channels (figure 1 shows plurality of transmit antennas and pluralities of transmit channels. See col 4, lines 11-34), wherein at least one of the plurality of transmit channels transports some data that is not transmitted over all of the other of the plurality of transmit channels (col 6, lines 26-29);
- transmitting a modified preamble from each of the plurality of transmit channels, wherein the modified preamble (see figures 5 and 6) is usable for performing

channel estimation and at least a first part of the modified preamble for at least a first of the plurality of transmit channels is a cyclically shifted version of a second part of the modified preamble for at least a second of the plurality of transmit channels (col 4, lines 22-34, col 6, lines 22-57).

Perahia et al. disclose all of the subject matter as described above except for specifically teaching wherein the first part and the second part comprise signal sequences with a low cross correlation between long training symbols.

However, Crilly et al. in the same field of endeavor teach wherein the first part and the second part comprise signal sequences with a low cross correlation between long training symbols (figure 4, par 0084, lines 3-12). Therefore, it would have been obvious to one ordinary skill in the art at the time the invention was made to use the method of low cross correlation as taught by Crilly et al. to modify the system and method of Perahia et al. in order to improve detection sensitivity.

**13. Claims 7-10, 46, 51-54, and 62 are rejected under 35 U.S.C. 103(a) as being unpatentable over Perahia et al. in view of Thomson et al.**

**Regarding claims 7 and 10:**

As shown in figures 1-6, Perahia et al. discloses a method of transmitting signals using a plurality of transmit channels, the method comprising:

- allocating the data to be transmitted among the plurality of transmit channels (figure 1 shows plurality of transmit antennas. See col 4, lines 11-34), wherein at least one of the plurality of transmit channels transports some data that is not transmitted over all of the other of the plurality of transmit channels (col 6, lines 26-29);
- transmitting a modified preamble (see figures 5 and 6) from each of the plurality of transmit channels (figure 1), wherein the modified preamble is distinguishable at a receiver from a conventional 802.1 la preamble (col 4, lines 22-34, col 6, lines 22-57).

Perahia et al. disclose all of the subject matter as described above except for specifically teaching and includes an out-of-band component.

However, Thomson et al. in the same field of endeavor teach and includes an out-of-band component (3.5 MHZ interpreted to be out-of-band component) (figures 1b and 4, par 0006, lines 14-17). Therefore, it would have been obvious to one ordinary skill in the art at the time the invention was made to use out-of-band component (3.5 MHz) as taught by Thomson et al. to modify the system and method of Perahia et al. in order to prevent interference between channels.

**Regarding claim 8:**

Perahia et al. disclose all of the subject matter as described above except for specifically teaching wherein the plurality of transmit channels comprise a plurality of frequency channels.

However, Thomson et al. in the same field of endeavor teach wherein the plurality of transmit channels comprise a plurality of frequency channels (figures 1b and

4, par 0006, lines 14-17). Therefore, it would have been obvious to one ordinary skill in the art at the time the invention was made to use frequency channels (20 MHz) as taught by Thomson et al. to modify the system and method of Perahia et al. in order to transmit information using frequency channels.

**Regarding claim 9:**

Perahia et al. disclose all of the subject matter as described above except for specifically teaching wherein the plurality of frequency channels are adjacent 20 MHz channels.

However, Thomson et al., in the same field of endeavor, teaches wherein the plurality of frequency channels are adjacent 20 MHz channels (figures 1b and 4, par 0006, lines 14-17). Therefore, it would have been obvious to one ordinary skill in the art at the time the invention was made to use frequency channels (20 MHz) as taught by Thomson et al. to modify the system and method of Perahia et al. in order to transmit information using frequency channels.

**Regarding claims 46 and 62:**

Perahia et al. disclose all of the subject matter as described above except for specifically teaching wherein the data corresponding to extensions to IEEE 802.11 a comprise data corresponding to transmission in a 40 MHz extended 802.11 mode.

However, Thomson et al., in the same field of endeavor, teaches wherein the data corresponding to extensions to IEEE 802.11 a comprise data corresponding to transmission in a 40 MHz extended 802.11 mode (figures and 4, par 0043). Therefore, it would have been obvious to one ordinary skill in the art at the time the invention was

made to use 40 MHz extended 802.11 mode as taught by Thomson et al. to modify the system and method of Perahia et al. in order to transmit information using frequency channels.

**Regarding claim 51:**

As shown in figures 1-6, Perahia et al. discloses a method of transmitting an extended mode packet intended for extended 802.11 receivers in a wireless medium, the method comprising:

- transmitting a modified preamble, the modified preamble comprising data transmitted on subcarriers considered by conventional 802.11 a receivers (figure 2), the modified preamble (see figures 5 and 6) comprising a plurality of fields (figures 5 and 6 shows plurality of fields) decodable by a conventional 802.11 a receiver such that a conventional 802.11 a receiver (figure 2) that receives the packet can detect the packet or defer processing for the length of the packet (figure 1, col 6, lines 22-57); and
- transmitting a remainder of the extended mode packet (col 6, lines 22-57).

Perahia et al. disclose all of the subject matter as described above except for specifically teaching out-of-band subcarriers.

However, Thomson et al. in the same field of endeavor teach out-of-band subcarriers (3.5 MHZ interpreted to be out-of-band component) (figures 1b and 4, par 0006, lines 14-17). Therefore, it would have been obvious to one ordinary skill in the art at the time the invention was made to use out-of-band component (3.5 MHz) as taught

by Thomson et al. to modify the system and method of Perahia et al. in order to prevent interference between channels.

**Regarding claim 52:**

Perahia et al. further disclose wherein said transmitting the modified preamble comprises transmitting the modified preamble (col 6, lines 22-57).

Perahia et al. disclose all of the subject matter as described above except for specifically teaching over a 40 MHz channel comprising two adjacent 20 MHz channels, and wherein the out-of-band subcarriers comprises subcarriers between the adjacent 20 MHz channels.

However, Thomson et al., in the same field of endeavor, teaches over a 40 MHz channel comprising two adjacent 20 MHz channels, and wherein the out-of-band subcarriers comprises subcarriers between the adjacent 20 MHz channels (3.5 MHZ interpreted to be out-of-band component) (figures 1b and 4, par 0006, lines 14-17) (figures 1b and 4, par 0006, lines 14-17). Therefore, it would have been obvious to one ordinary skill in the art at the time the invention was made to use frequency channels (20 MHz) as taught by Thomson et al. to modify the system and method of Perahia et al. in order to transmit information using frequency channels.

**Regarding claim 53:**

Perahia et al. disclose all of the subject matter as described above except for specifically teaching wherein the out-of-band subcarriers comprise subcarriers in addition to the 52 non-zero subcarriers utilized by conventional 802.11 a receivers for 20 MHz transmission.

However, Thomson et al., in the same field of endeavor, teaches wherein the out-of-band subcarriers (3.5 MHZ interpreted to be out-of-band component) (figures 1b and 4, par 0006, lines 14-17) comprise subcarriers in addition to the 52 non-zero subcarriers utilized by conventional 802.11 a receivers for 20 MHz transmission (figures 1b and 4, par 0006, lines 14-17). Therefore, it would have been obvious to one ordinary skill in the art at the time the invention was made to use frequency channels (20 MHz) as taught by Thomson et al. to modify the system and method of Perahia et al. in order to transmit information using frequency channels.

**Regarding claim 54:**

Perahia et al. further disclose wherein said transmitting the remainder of the extended mode packet comprises transmitting the remainder of the extended mode packet (col 6, lines 22-57).

Perahia et al. disclose all of the subject matter as described above except for specifically teaching using said out-of-band subcarriers.

However, Thomson et al., in the same field of endeavor, teaches using said out-of-band subcarriers (3.5 MHZ interpreted to be out-of-band component) (figures 1b and 4, par 0006, lines 14-17) (figures 1b and 4, par 0006, lines 14-17). Therefore, it would have been obvious to one ordinary skill in the art at the time the invention was made to use frequency channels (20 MHz) as taught by Thomson et al. to modify the system and method of Perahia et al. in order to transmit information using frequency channels.

**14. Claim 13-17, 19, 28, 31-33, 36, 37, and 55-58 are rejected under 35 U.S.C. 103(a) as being unpatentable over Perahia et al. in view of Larsson et al. (US 20020118771).**

**Regarding claim 13:**

As shown in figures 1-6, Perahia et al. discloses a method of discriminating between a packet sent as a conventional 802.11a packet and a packet sent using an extended mode not normally supported under the conventional 802.11 a standard, the method comprising:

- receiving a signal from a wireless medium (figure 1), wherein the signal was transmitted from an extended mode transmitter as a packet wherein packet data is preceded by a packet preamble (col 6, lines 22-57);
- demodulating the signal to obtain a demodulated signal (figure 2, col 4, lines 35-42);
- decoding (210 in figure 2) from the demodulated signal a packet data sequence (figure 5 and 6) when receiving packet data from an extended mode transmitter and a conventional 802.11 a preamble when receiving packet data from a conventional 802.11 a transmitter (col 6, lines 22-57); and
- discriminating as to which type of packet was sent based on the received packet data sequence (col 5, lines 16-36, col 6, lines 22-57).

Perahia et al. disclose all of the subject matter as described above except for specifically teaching wherein the packet preamble is generated from a cyclically shifted 802.11 a preamble and including a cyclically shifted 802.11 a preamble.

However, Larsson et al. in the same field of endeavor teach wherein the packet preamble is generated from a cyclically shifted 802.11 a preamble and including a cyclically shifted 802.11 a preamble (par 0070, 0071, 0073, and 0076). Therefore, it would have been obvious to one ordinary skill in the art at the time the invention was made to use cyclically shifted preambles as taught by Larsson et al. to modify the system and method of Perahia et al. in order to extract individual channel impulse responses from the received signal easily.

**Regarding claim 14:**

Perahia et al. further discloses wherein the extended mode includes at least a MIMO extended mode wherein the packet preamble is generated from the cyclically shifted 802.1 la preamble (col 6, lines 22-57).

**Regarding claim 15:**

Perahia et al. further discloses further comprising performing MIMO channel estimation using the received preamble data (abstract, col 1, lines 55-65).

**Regarding claim 16:**

Crawford et al. further discloses further comprising performing MIMO channel estimation using the received preamble data (abstract, col 1, lines 55-65).

**Regarding claim 17:**

Perahia et al. further disclose wherein the signal transmitted from an extended mode transmitter is such that legacy devices can decode (210 in figure 2) a signal field of the preamble (figure 2, col 4, lines 35-42, col 5, lines 16-36, col 6, lines 22-57).

**Regarding claim 19:**

Perahia et al. further discloses detecting that the signal transmitted used from an extended mode transmitter using a MIMO mode (col 5, lines 16-36, col 6, lines 22-57).

Perahia et al. disclose all of the subject matter as described above except for specifically teaching the detecting including detecting a presence of cyclically shifted preamble components.

However, Larsson et al. in the same field of endeavor teach the detecting including detecting a presence of cyclically shifted preamble components (par 0070, 0071, 0073, and 0076). Therefore, it would have been obvious to one ordinary skill in the art at the time the invention was made to use cyclically shifted preambles as taught by Larsson et al. to modify the system and method of Perahia et al. in order to extract individual channel impulse responses from the received signal easily.

**Regarding claims 28 and 55:**

As shown in figures 1-6, Perahia et al. discloses a method of transmitting signals using a plurality of transmit channels, the method comprising:

- allocating the data to be transmitted among the plurality of transmit channels, wherein at least one of the plurality of transmit channels transports some data that is not transmitted over all of the other of the plurality of transmit channels (col 6, lines 26-29);
- transmitting a modified preamble (see figures 5 and 6) from each of the plurality of transmit channels (figure 1), wherein the modified preamble is usable for performing channel estimation and at least a part of the modified preamble for at least a first of the plurality of transmit channels is version of a corresponding part of the modified

preamble for at least a second of the plurality of transmit channels (col 4, lines 22-34, col 6, lines 22-57).

Perahia et al. disclose all of the subject matter as described above except for specifically teaching a cyclically shifted.

However, Larsson et al. in the same field of endeavor teach a cyclically shifted (par 0070, 0071, 0073, and 0076). Therefore, it would have been obvious to one ordinary skill in the art at the time the invention was made to use cyclically shifted preambles as taught by Larsson et al. to modify the system and method of Perahia et al. in order to extract individual channel impulse responses from the received signal easily.

**Regarding claim 31:**

Perahia et al. further discloses further comprising MIMO synchronization (col 5, lines 28-31).

**Regarding claim 32:**

Perahia et al. further discloses wherein the data to be transmitted is allocated to a plurality of subcarriers, the subcarriers of the plurality of subcarriers are allocated among transmit channels, and each transmit channel is associated with a distinct antenna (see figure 1, col 6, lines 22-57).

**Regarding claim 33:**

Perahia et al. further discloses wherein the data to be transmitted is allocated to a plurality of subcarriers and some of the subcarriers of the plurality of subcarriers are inverted relative to other subcarriers of the plurality of subcarriers (col 6, lines 22-57).

**Regarding claim 36:**

Perahia et al. further disclose wherein said part and said corresponding part comprise long training fields (see figure 5 and 6).

**Regarding claim 37:**

Perahia et al. further disclose wherein said part and said corresponding part comprise signal fields (see figure 5 and 6).

**Regarding claim 56:**

Perahia et al. further disclose wherein the plurality of fields includes data corresponding to extensions to IEEE 802.11 a (see figure 5 and 6).

**Regarding claim 57:**

Perahia et al. further disclose wherein one of the plurality of fields comprises a long training field (see figure 5 and 6) including data corresponding to MIMO transmission and reception (figure 1, abstract).

**Regarding claim 58:**

Perahia et al. further disclose wherein the plurality of fields are decodable by a conventional 802.11 a receiver such that a conventional 802.11 a receiver that receives the extended mode packet can detect the packet or defer processing for the length of the packet (col 6, lines 22-57), and wherein the modified preamble further comprises one or more fields including data corresponding to extensions to IEEE 802.11 a (see figures 5 and 6).

**15. Claims 18 and 34 are rejected under 35 U.S.C. 103(a) as being unpatentable over Perahia et al. in view of Larsson et al. as applied to claims 13 and 28 above and further in view of Thomson et al.**

**Regarding claim 18:**

Perahia et al. further discloses detecting that the signal transmitted used from an extended mode transmitter using a MIMO mode (abstract).

Perahia et al. disclose all of the subject matter as described above except for specifically teaching the detecting using at least one out-of-band subcarrier.

However, Thomson et al. in the same field of endeavor teach the detecting using at least one out-of-band subcarrier (3.5 MHZ interpreted to be out-of-band component) (figures 1b and 4, par 0006, lines 14-17). Therefore, it would have been obvious to one ordinary skill in the art at the time the invention was made to use out-of-band component (3.5 MHz) as taught by Thomson et al. to modify the system and method of Perahia et al. in order to prevent interference between channels.

**Regarding claim 34:**

Perahia et al. further discloses wherein the data to be transmitted is allocated to a plurality of subcarriers (col 6, lines 22-57).

Perahia et al. disclose all of the subject matter as described above except for specifically teaching including at least one out-of-band subcarrier.

However, Thomson et al. in the same field of endeavor teach including at least one out-of-band subcarrier (3.5 MHZ interpreted to be out-of-band component) (figures

1b and 4, par 0006, lines 14-17). Therefore, it would have been obvious to one ordinary skill in the art at the time the invention was made to use out-of-band component (3.5 MHz) as taught by Thomson et al. to modify the system and method of Perahia et al. in order to prevent interference between channels.

**16. Claim 35 is rejected under 35 U.S.C. 103(a) as being unpatentable over Perahia et al. and Larsson as applied to claim 28 above and further in view of Crawford et al. (US 20020160737)and Moose et al. (US 2002/0065047).**

**Regarding claim 35:**

Perahia et al. further disclose estimating channel (abstract) response by:

- receiving signals and sampling for a long training symbol (see figures 5 and 6) pattern distinct from a conventional 802.11 a long training pattern (col 6, lines 22-57);

Perahia et al. and Larsson et al. disclose all of the subject matter as described above except for specifically teaching computing a 64-point FFT of the received long training symbol; multiplying each subcarrier by known pilot values computing an IFFT of the result of the multiplication, resulting in a 64-point impulse response estimate; isolating each of a plurality of impulse responses, one per MIMO transmitter; and deriving channel estimates for all subcarriers from the isolated impulse responses by

taking a 64-point FFT of each of the plurality of impulse responses, where the sample values are appended by zero values to get 64 input values as needed.

However, Crawford et al. in the same field of endeavor teach computing a 64-point FFT (N-Point FFT is interpreted to be a 64-point FFT) of the received long training symbol (N-Point FFT in figure 12A); multiplying each subcarrier by known pilot values (figures 5 and 6). Therefore, it would have been obvious to one of ordinary skilled in the to use 64-point FFT of Crawford et al to modify the system and method of Perahia et al. in order to process the received signal in the desired domain.

Perahia et al., Larsson et al., and Crawford et al. disclose all of the subject matter as described above except for specifically teaching computing an IFFT of the result of the multiplication, resulting in a 64-point impulse response estimate; isolating each of a plurality of impulse responses, one per MIMO transmitter; and deriving channel estimates for all subcarriers from the isolated impulse responses by taking a 64-point FFT of each of the plurality of impulse responses, where the sample values are appended by zero values to get 64 input values as needed.

However, Moose et al., in the same field of endeavor, computing an IFFT of the result of the multiplication, resulting in a 64-point impulse response estimate (paragraph 0024, lines 1-4); isolating each of a plurality of impulse responses, one per MIMO transmitter; and deriving channel estimates for all subcarriers from the isolated impulse responses by taking a 64-point FFT of each of the plurality of impulse responses, where the sample values are appended by zero values to get 64 input values as needed (par 0045).

One of ordinary skill in the art would have clearly recognized in order evaluate signals, the signal needs to be evaluated either in time domain or frequency domain. To evaluate the signal in the desired domain a Fast Fourier Transform FFT or Inverse Fast Fourier Transform IFFT algorithm is used. To process 64 sample points at 20 MHz sampling rate and is called the OFDM FFT processing interval. Also the OFDM symbols can be generated by a length 64 inverse fast Fourier transform IFFT. To generate OFDM-MIMO symbol by a length of 64-point, it would have been obvious to one ordinary skill in the art at the time the invention was made to use the FFT and IFFT algorithm as taught by Moose et al. in synchronization and channel estimation system. Using FFT and IFFT are of great importance to a wide variety of applications such as digital signal processing.

### ***Conclusion***

17. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Kabir A. Timory whose telephone number is 571-270-1674. The examiner can normally be reached on 6:30 AM - 3:00 PM Monday-Friday.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Shuwang Liu can be reached on 571-272-3036. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for

published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/Kabir A Timory/
Examiner, Art Unit 2611
/Shuwang Liu/
Supervisory Patent Examiner, Art Unit 2611